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ABSTRACT

The aim of the DEDICATE (Distance Education Information Courses with Access through Networks) project, funded through the European Union, is to develop distance education courses in training for information literacy. The DEDICATE courses are based on the use of the Internet and World Wide Web; communication between participants and tutors and within participating groups is supported by electronic conferencing software. This paper begins with a discussion of information literacy and the learning process. The aims and design of the DEDICATE courses are then described. Highlights include: (1) organizational context, including the importance of library managers' support at the institutions concerned; (2) participants and their expectations; (3) the learning environment, including key features of the interface; (4) course overview; (5) learning modules, consisting of five units that address the Internet as a learning environment, search for information in a selected subject area, the institutional context, the design of an information literacy course, and learning and course review; and (6) evaluation. Figures include a model of student learning and the "Into Info" home page. (Contains 32 references.) (MES)

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INFORMATION LITERACY COURSES IN ENGINEERING AND SCIENCE – THE DESIGN AND IMPLEMENTATION OF THE DEDICATE COURSES

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1. Introduction

In recent years, technological development within computing and communication has provided the potential for networked distance education courses. The **DEDICATE - Distance Education Information Courses with Access Through Networks - project** is funded under the EU Fourth Framework Telematics for Libraries program. The aim of the **DEDICATE** project is to develop distance education courses in "Training for Information Literacy." The DEDICATE project started in May 1998 and will run until September 1999. The distance education courses will be demonstrated and tested at four sites in Technological Universities in Estonia, Hungary, Latvia and Lithuania and at the International Center for Information Management, Systems, Services, Torun, Poland. This paper will begin with a brief discussion about information literacy and the learning process. This will be followed by a description of the aims and design used for the DEDICATE courses and the running of these courses at the five test sites.

2. What is information literacy

Information literacy can be described in a variety of ways, for example as a series of skills (Bruce, 1997).[1] A distinction can be made between "general" and "subject-related information literacy. The first is related to lifelong learning skills and enrichment of the quality of life and can be applied across many disciplines. This kind of information literacy have been expressed by the American Library Association in "None Information Literacy Standards for Student Learning" – http://www.ala.org/aasl/ip_nine.html [2]

> *"The methods of the scientist would be of little avail if he had not at his disposal an immense stock of previous knowledge and experience. None of it probably is quite correct, but it is sufficiently so for the active scientist to have advanced points of departure for the work of the future."*
>
> J.D.Bernal, Science in History, 1971 [3]

Subject-specific information literacy has additional dimensions, and is closely related to the pattern of information flow within that discipline. In the physical and natural sciences, medicine and many engineering subjects, the flow of published information has been described by the Garvey-Griffith model, which showed that different information channels and sources are suitable for different information needs (or problems). [4] The original model can be modified to include more recent forms of electronic communication (Hurd et al, 1996). [5] The process of information searching varies depending on the information needs of the user. Allen pointed out that the needs of individuals working on projects varies as the project progresses (Allen, 1977) [6]. User needs and related information searching practice has been studied by a number of researchers during the last ten years, examples are by Palmer, 1991, [7] Kulthau, 1991, [8] Ellis et al, 1993, [9] Wilson, 1994, [10] Ingwersen, 1996, [11] Ellis & Haugen, 1997, [12] and Limberg, 1998. [13] The actual context or task strongly influences search behaviour and may well

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influence the learner´s perception of information literacy. This is particularly relevant in education today where there is much emphasis on problem-based learning. Information seeking is, however, rarely an isolated event, but can be seen as a cyclic process which is carried out in a number of successive searches throughout learning and/or project work.(Wilson, 1998) [14]. The perceptions of information literacy can be expected to change throughout these processes.

3. Approaches to learning

Many of the earlier models for teaching user education were based on the teaching process (Fjällbrant, 1984, Eisenberg & Berkowitz, 1990, Huston, 1991, Kulthau, 1993). [15] [16] [17] [18] Currently in higher education, emphasis has shifted from teaching towards facilitating learning. Learning can be described as a process of change in which the process and the outcomes vary in different people. Students' approaches to learning describe the way that they set out to tackle a given learning task or piece of work. One important concept in research in student learning is that there are different *approaches to learning* – for example experiential or theoretical. The approach can also vary with the type of task that is the approach is context-specific. In the 1970s, group of researchers led by Ference Marton at the Department of Education and Educational Research at the University of Gothenburg, started to explore and describe ways of conceptualising and learning a topic. Emphasis shifted from measurement of the *quantity* of material learned to the *quality* of the learning (Marton, 1981). [19] This research approach is called *phenomenography*. It is based on, in the first instance, a set of qualitatively distinct ways in which students conceptualise the *phenomena* that they are learning about. Marton (1993) defines a phenomenon as "the logically structured complex of the different ways of experiencing an object." [20] Rather than looking at how students solve a problem, say by the use of equations representing Newton's Laws, the phenomenographer studies how students conceptualise the Laws.

Learning is measured in terms of the quality of understanding and its relevance to the learning situation. It is based on the assumption that knowledge is relational, where the relation is between the knower and the object. This provides valuable insight for the teaching/learning situation which is dependent not only on the knowledge of the lecturer, but also on the way in which that can be experienced by the students.

In 1979, Roger Säljö carried out a study, based on interviews, which led to the description of five conceptions of understanding of learning:

1. Learning as a quantitative increase in knowledge. Learning is acquiring information or "knowing a lot."
2. Learning as memorising. Learning is storing information that can be reproduced.
3. Learning as acquiring facts, skills, and methods that can be retained and used as necessary.
4. Learning as making sense or abstracting meaning. Learning involves relating parts of the subject matter to each other and to the real world.
5. Learning as interpreting and understanding reality in a different way. Learning involves comprehending the world by interpreting knowledge (Säljö, 1979) [21]. A sixth conception can be added to the first five:
6. Learning as changing a person, where the learner sees that there are different ways of seeing a given phenomenon - a multifaceted world (Marton & Booth, 1997) [22].

The conceptions in the latter three categories are qualitatively different from the first three, in that they are more complex and are connected with meaning, understanding and perceptions of phenomena. They emphasise the personal aspect of learning in which learning is something that you do in order to be able to understand and relate to the real world. The concepts in the first three statements have been described as related to *surface learning* as opposed to those in the last three statements which have been linked to *deep learning*. The latter implies understanding and facilitates retention, whereas matter that is acquired by surface learning is soon forgotten. A deep approach to learning is linked to the quality of the learning

responses.

What kinds of course design and strategies can we, as course designers, choose, in order to help our students with their studies? How can we encourage a deep approach to learning? There are a number of ways in which learning can be stimulated:

1. **Motivation** when there is an interest to carry out the given task or project. In the DEDICATE courses the participants, who are adults, will have a greater interest in learning if they feel that the task is relevant to their real life situation.
2. **Activity** - active work on for example, a problem, or a text, where participants are encouraged to reflect and construct their own meanings.
3. **Interaction** - where students are encouraged to interact with others (both students and tutors) in order to discuss and reformulate their ideas.
4. **Feedback** - information on the progress being made should be available to participants - this can be provided partly through interaction and partly by formal assessment activities.
5. **Knowledge-base** - access to a well structured knowledge base is a very valuable cognitive input which can act as a starting point for learning activities.

In the DEDICATE courses we are addressing distance learning and here there is an important addition - the need to provide support of an affective kind for participants who might well be working in relative isolation. Not only must we facilitate interaction for the discussion of meanings and theories and phenomena, we must provide support for students who can feel uncertain and confused in their learning roles. Adult learners have a complex background. In a typical adult learner group, the following variables can differ: educational backgrounds, socio-economic factors - family situations pressure of work at home etc., organisational context and learning environments, motivation and conceptions of learning. The student's conception of learning is of considerable importance, as has been pointed out by Laurillard, because this is the way that they believe that they can come to know (or learn). (Laurillard, 1993). [23] A model of student learning has been presented by (Morgan, 1995) [24] in a book about Open and Distance Learning Today, which shows how these various parameters can affect the learning outcomes. This serves as the basis for Figure 1.

Fig.1. Learning model

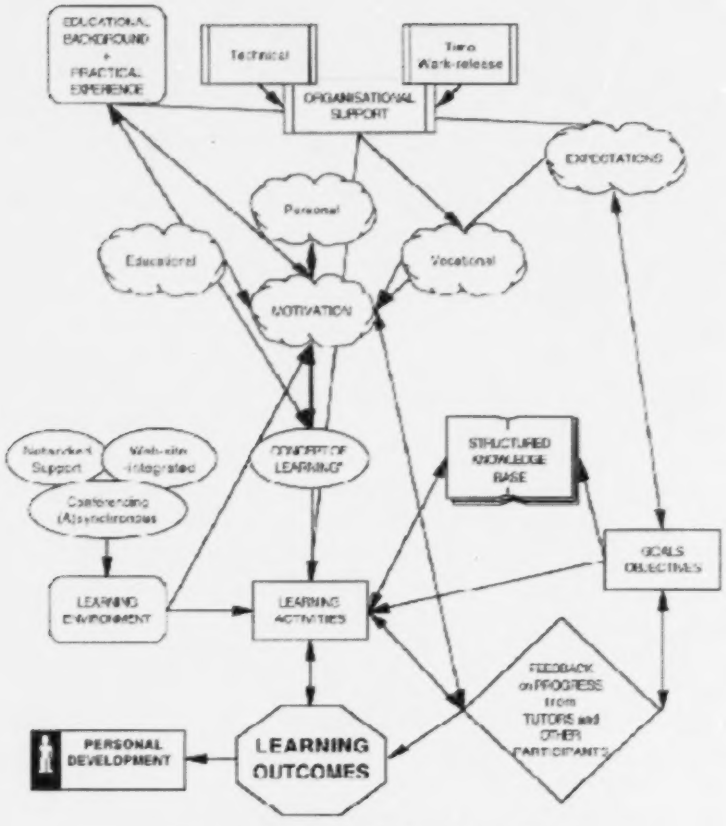

Fig.1. Model of Student learning

In designing courses it is necessary to try to provide situations which facilitate the learning process, taking into account that participants (and teachers) are individuals with different starting points and requirements. A key feature is to try to stimulate students motivation. In order to plan for distance learning courses it is important for the teachers to find out as much as possible about the backgrounds of the participants: their expectations from the course, their educational background, their working conditions - institutional support - and, if possible, their conceptions of learning.

4. The DEDICATE courses – Training for Information Literacy

The aim of the DEDICATE project is to develop distance education courses in "Training for Information Literacy." This will be achieved through training the trainers – giving librarians and academic staff an opportunity to experience and reflect about their own ways of looking for information, then moving from this to study information literacy and design courses suitable for their own organisations. The aim of the DEDICATE project is to produce courses related to the needs of individual students as well as to those of their institutions.

DEDICATE courses are based on the use of the Internet and the World Wide Web. Communication between individual participants and tutors, and within participating groups has been supported by means of electronic conferencing software. In this type of interactive distance course it is extremely important to provide networked user support and in the DEDICATE course design special attention has been paid to the

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needs of the participants in this respect. Cognitive learning support has also been provided through the use of the *Into Info* programs, which have been derived from work carried out during the EU Telematics for Libraries EDUCATE project. [25] Support has also been available for participants in the form of document supply.

5. The DEDICATE courses - organisational context

In the case of the DEDICATE courses, participants will be taking part in professional continuing education about how to design Information Literacy Courses for Library Users in the Higher Education Sector. [26] It is extremely important to see that this work, which will involve people in time-consuming study, has the support of the Library Managers at the institutions concerned. This is important for a number of reasons:

1. The possibility to produce a real useable course - for the institution will be a highly motivating factor.
2. The participants will have to work hard and it is desirable that some period of work-release be granted each week.
3. It is necessary to know that the students will have access to technical support - equipment necessary for participation and help from a technician if this is necessary.
4. The interest and support of the Library Managers for their local participants can really act as an encouraging factor.

To this end a Questionnaire for Institutional Managers was produced and sent out to the Library Directors from the 5 CEE sites:

Tallinn University of Technology - Estonia
Veszprém University - Hungary
Riga Technical University - Latvia
Kaunas University of Technology - Lithuania
Nicholas Copernicus University – Poland

prior to the DEDICATE Start-up Meeting in May 1998. All institutional managers agreed to provide between 4-6 hours of work-release time for the duration of the course. The Timetable for the course was discussed, with respect to causing minimum disruption of library. Access and use of technical equipment was guaranteed, together with any necessary technical support.

6. The participants and their expectations

As mentioned above, in distance learning courses it is important for the teachers to find out as much as possible about the backgrounds of the participants: their expectations from the course, their educational background, their working conditions -institutional support - and, if possible, their conceptions of learning. This is very important for being able to provide student support during the distance learning course. [27] For this purpose a Participants Questionnaire was designed. This questionnaire was presented at the initial DEDICATE Course Start-up Meeting at each site (see Section 8, Unit 1). Participants were asked to take time to reflect on their expectations - why they were doing the course, and what they hoped to get out of taking part, and to express any concerns they might have about it. This was followed by a discussion between participants and their DEDICATE tutor(s). Later participants were asked to fill in an electronic form about their personal goals. It was important to see that there was no conflict between the individual goals and those expressed by the institutional managers.

7. The learning environment

The learning activities of students, in higher education, have been described by Laurillard in terms of five interdependent aspects of the learning process: [23]

- **apprehending** the structure of the material. interpreting the structure and organising as a coherent whole;
- **integrating** the representation of the material with the meaning, for example using language, mathematics, classification systems;
- **relating** knowledge to experience, relating theory to practice;
- using **feedback** - both intrinsic and extrinsic - to adjust actions to fit the task goal and descriptions to fit the topic goal;
- **reflecting** on the goal-action-feedback cycle.

Ideally the learning process should take the form of an interactive dialogue between teacher and student, where both are in agreement on the learning goals for the topic.

The DEDICATE courses started with an initial face-to-face start-up meeting between the participants and their tutors. Tutoring and technical support was distributed geographically. Members of the support team were located at Chalmers University and Linköping University in Sweden, Helsinki University of Technology, Finland and Sheffield University, UK.

A key concept underpinning the technical environment for the course was that it should support active, collaborative and independent learning, and be perceived as far as possible by the user as an integrated Web application, offering easy and rapid access to a distributed range of facilities and resources. Key features of the interface, facilities and resources of the DEDICATE course were based on a frames-based Web environment, offering easy orientation and navigation within the DEDICATE course site. This was based on the design used in the NetLinks Project, at Sheffield University Department of Information Studies, under the UK e-lib programme. [28] [29] [30] The interface provided access to:

- the 5 Units of the Course (see below);

- a structured knowledge base - the Resource Base. This was structured so as to include the "essential" required reading for each Unit. In addition a subject based resource base of items was included. This division between the most important resource material and other material which can be useful for some projects has been introduced in order to avoid overwhelming participants with resources;

- asynchronous conferencing facilities for group discussion and tutorial and/or technical support. The main discussion facility for the course was *Focus* - an electronic conferencing software program, developed in the UK. [31] One discussion group took the form of a casual meeting place - the DEDICATE Café. A General Discussion Forum was available, as well as forums for each group to stimulate discussions and interactivity between the participants and between participants and tutors. In addition there were centres for discussion of technical and information issues;

to the Web-based *Into Info* programs developed on the basis of work carried out in the EU Telematics for Libraries project EDUCATE. [25] [32] *Into Info* programs were used to provide cognitive subject support about information patterns. Currently the *Into Info* programs are available in the following subject fields: Architecture, Chemistry, Electronic and Electrical Engineering, Energy, Environmental Information, History of Science and Technology, Physics and Medicine. The *Into Info* programs are based on an initial hierarchic structure on three levels, with many internal and external hyperlinks, so that users are free to follow their own needs and choices. The first level of the hierarchy offers seven alternatives (see Figure 2).

Snapped with HyperSnap-DX
http://www.hyperionics.com

Into Info Program - History of Technology

Pathfinder	Different routes to follow for different information needs: Starting to use the Library - Starting a P Research - Keeping Up-to-Date - Looking for Facts - Handling Search Products - Internet Resou Societies
Course	Course Goals - Scientific Communication Channels - Types of Information Search - Search Proc Searching - Demonstrations
Texts	Communication in Science and Technology, Scholarly Communication, Lists of Terms, Abbrevia
Internet	Introduction to the Internet - WWW - Internet Courses - Browsers - Search Engines - How to Cr
IT +++	A collection of general Web-based information sources in addition to those found under the subj News, Museums, History of Technology, Drama, Film, Music, Travel, etc.
Index	Index to the Into Info History of Science and Technology Module
New Subject	Click on the COMPASS in the bar at the bottom of each page. This will take you to the *Into Info* you can select a subject
Local Library	This is a "pop up" box which contains links to your Local Library Catalogue and the Library Wet available for users with a campus site licence)
Evaluate	A link to Evaluation Forms - applies to selected courses such as DEDICATE

Into Info Home Page

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Fig. 2. Into Info approaches

8. Course overview

Experience from previous distance education courses such as INFOVISION and the NLS Programme have demonstrated the need for very clear and non-equivocal material. This is particularly the case when participants are having to work in a language other than their mother tongue, A Course Overview was prepared to introduce the course:

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1. Background - the need for education in information literacy
2. The DEDICATE project
3. Aims and objectives of the DEDICATE Course
4. Timetable and planned activities
5. Course approach and material
6. Equipment and software
7. The forms of examination
8. Evaluation
9. Address to the DEDICATE homepage: http://educate.lib.chalmers.se/DEDICATE/dedindex.html

9. The learning modules - Units 1-5
Course material has been divided into 5 Units:

Unit 1 - The Internet as a learning environment - introduction to the technologies
Unit 2 - Search for information in a selected specified subject area
Unit 3 - The institutional context - reflection, planning for the design of an information literacy course
Unit 4 - The design of an information literacy course for a specific user group within the institution
Unit 5 - Learning review and course review

A similar structure was used for each unit with aim of simplifying navigation for the participants.

In the first unit participants became familiar with using the network technologies and communicating with each other, and in general developing their information technology skills. Next came Unit 2 which aimed at providing participants with experiential learning in information searching and evaluation. This in turn provided some experience for the choice of a suitable Information Literacy course for the paticipants´ own institutions, a subject for reflection and negotiation in Unit 3. Unit 4 was for the team design of the chosen course, with access to expert consultants at all stages. Unit 5 will be a time for reflection and discussion about learning outcomes and for evaluation of the DEDICATE Course.

Great care was taken to make the instructions as clear as possible, for example by including Check Lists and details about the Reporting required. The Units were pre-tested by a "guinea-pig" student who had Swedish/Finnish as her first languages. The examination form was sometimes individual and sometimes based on group work. The latter has been used primarily to encourage discussions and reflections - as there are, in many situations, many possible ways of answering a given question.

10. Evaluation
Formative evaluation has been carried out throughout the course, by means of discussions with respective course tutors. It has been noted that one of the advantages in distance and/or flexible learning, is the possibility for individual students to have far more interaction with their tutors than in the "traditional classroom" situation. This has been commented on by many of the participants and tutors. The summative evaluation of the course will take place in connection with Unit 5. A feature of this will be the assessment of personal learning outcomes by the participants themselves. A web-based questionnaire has been constructed and will be used for part of the summative evaluation. A final "evaluation of outcomes" report will be written three months after the end of the project.

At the time of writing, the first three units of the course have been completed, and the participants are well

on their way to designing courses for use in their universities. Examples of these proposed courses are:

Tallinn University of Technology, Estonia. Information Literacy courses for postgraduate students in Computer and Systems Engineering, and Electronics and Biomedical Engineering Control. The course will carry University credits and is planned for implementation in Spring 2000.

Veszprém University, Hungary. A course in Information Literacy in connection with Environmental Engineering studies. This will be given for third year undergraduates taking a five-year course. Information searching will be directed towards environmental protection, in connection with problems of hazardous waste and air- water- and soil-pollution.

Riga Technical University, Latvia. An Information Literacy course for third year undergraduates in Chemistry and Chemical Technology, planned for the autumn term of 1999, and an Information Literacy Course for second year undergraduates in the Faculty of Radio-engineering and Telecommunications, also planned for autumn 1999.

11. Discussion

In view of the rapid changes that are taking place in information transfer and the increasing variety in ways and forms of access, many users face uncertainty in information seeking and handling. There is a very real need for the development of information literacy training in European countries. The networked courses developed in the DEDICATE project appear to offer a very suitable form for professional development. One particularly interesting feature is the joint training of librarians and academic staff, that has been implemented at most of the sites. This would appear to lead to a valuable link between the library as an information provider and the parent organisation. In those courses where the two groups have been involved, it has been shown that there are advantages in the development and integration of new information literacy courses into the academic programme of the universities. It is to be hoped that it will be possible to continue this work of Training the Trainers in future years, thus realising the full potential of this European project.

IATUL members are encouraged to follow progress through the DEDICATE Newsletter at:

http://educate.lib.chalmers.se/DEDICATE/news.html

This describes DEDICATE dissemination activities. You may wish to note that a DEDICATE seminar is planned for September, 1999 at the ICIMSS, Torun, Poland. Librarians interested in the implementation of courses similar to the DEDICATE Training Courses are invited to contact the authors of this paper.

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